first species mentioned would be likely to introduce confusion.

When genera are based on recent species it may be assumed that, as a rule, no one species is more obscure than another, so that, *ceteris paribus,* there is no objection to taking as genotype the first mentioned. Indeed the first mentioned is in most cases likely to be the best known, although every one is aware that it is not so in all cases. But when genera are based mainly or entirely on fossils there is a great difference between the values of the different species. The common-sense thing to do in such a case is to select the most completely preserved and best-known species as genotype.

If now one considers the general action of previous revisers in dealing with paleontological material, one notes a general tendency either to select as genotypes, or at all events to regard as representative, those species which are the least obscure. In other words, the historical development of the science has resulted in the common-sense method of interpreting genera by their best known species.

To leave the selection to an arbitrary rule that is as likely as not to fix on an obscure fragment would in itself be contrary to common sense; but the first species method now proposed not merely ignores these important factors of clearness and familiarity, but actually tends in the case of fossils towards the greatest obscurity. For this reason, many new species established by paleontologists have been introduced in monographs or papers dealing with series of fossils from various horizons; and it has generally been the custom of paleontologists, in discussing the species under review, to follow a stratigraphical order, beginning with the oldest rock. Consequently, when a paleontologist founds a new genus, the first species that he mentions is generally the oldest, and for this very reason it is generally also the most obscure. In many cases then the first species rule would lead to the inevitable selection of the most obscure species as the type of a genus. A rule of which this can be said may work with mathematical exactness and automatic precision, but its final result must be to introduce, or rather to force, into zoological nomenclature fresh elements of uncertainty and change.

F. A. BATHER

LONDON, S. W., ENGLAND,
April 29, 1907

THE GREAT INFERIOR TUSKED MASTODON OF THE LOUP FORK MIOCENE

IN 1882 I discovered a jaw of this mastodon on the Sappy, in Decatur County, while in the employ of the Museum of Comparative Zoology at Cambridge. A single jaw was present measuring four feet to the end of the tusk. Last year while on an expedition for the Royal Museum of Munich in the same beds on the Prairie Dog, I collected a very perfect set, without the tusks; length of the preserved jaws two and a half feet, height at condyles fourteen inches, height of grinding surface of the single last molar nine and a half inches. Last season my son was so fortunate as to discover in Scott County, near the Gove County line, a very complete and well-preserved set of lower jaws of a huge specimen so different in several respects from the other two mentioned, a separate form may be represented. The peculiarity lies in the low condyle that is only thirteen and a half inches high, and in the great depression of the rostrum, thirteen inches lower than the teeth at its distal end. The length of the jaws are four feet and one inch long. The distance between the condyle and distal end of rostrum or beak, four feet three and a half inches. But one well-preserved molar, the last, in each jaw their greatest height is ten inches; height of crown two and a half inches, length nine and a half inches, width three inches, distance between the molars four inches. This is the largest specimen in my experience ever taken from the Loup Fork Miocene beds of Kansas, and point to an animal of large proportions.

In this connection I would like to put on record the description of the largest tusk of *Elephas columbi,* or the great Columbian mammoth, of which such a fine example is now mounted in the American Museum, New York City. I discovered this tusk with a lot of teeth; several of them are now preserved in the State University Museum of Kansas and

others in the American Museum in Lane Co., Kansas.

It measured fourteen feet in length and was eight inches in diameter at its proximal end where it was broken from the upper jaw. Dr. Matthews assures me that it is the largest specimen so far recorded, I regret to say that it was not saved owing to its friable nature.

CHARLES H. STERNBERG

CONCERNING STENO

TO THE EDITOR OF SCIENCE: It happens to all of us to fancy that what is new to us must be new to the world; and if we fail to look in the right places we do not become disenchanted.

The recent reference in SCIENCE (May 10) to Steno's noted work on crystallography and a newly-discovered English translation of it, led me to wonder if all the great bibliographers had overlooked the latter. The four authorities that came to hand first were Brunet, the British Museum Catalogue, Watts's 'Bibliotheca Britannica' and Poggendorff's 'Biog.-lit.-Worterbuch'; all of these include H. O.'s translation of Steno, except Brunet, who has few scientific titles and does not include this in any language. The translation is also cited in the 'Catalogue' appended to Young's 'Natural Philosophy,' about 1805.

The guess and conclusion that H. O. was Henry Oldenburg is confirmed by the article about him in the 'Dictionary of National Biography.'

This incident will strengthen the views of those who think that a prerequisite to any advanced degree should be a short course in bibliography; for, whatever Pope meant by his lines, they are increasingly true to-day:

* * * Index-learning turns no student pale,
Yet holds the eel of science by the tail.

C. K. W.

WASHINGTON, D. C.,
June 4, 1907

SPECIAL ARTICLES

ON SUN SPOTS

APROPOS of certain recent discussions on solar activity to which I listened with pleasure in Philadelphia, I have wondered whether a possible analogy between geyser-like action and periodic solar disturbance has been suggested. For instance, let the line *td* in the diagram represent the distribution of temperature and depth below the solar surface, or, from some points of view, the distribution of temperature relative to pressure. Let the line *tp* represent the condition of transition, referred to temperature and depth, from an atomic form *A* to an atomic form *B*. Below the *tp* line the element *B* is stable, above it *A* is stable. At depths corresponding to *c* or *c'*, therefore, neither form is persistently stable, but as the spherical shells are thin there need be no marked consequences. To make the engine work, two points of intersection, *c*, should occur.

I shall assume that the transition of *A* into *B* takes place along a doubly inflected intrinsic isotherm for the system *AB*, after the manner explained by James Thomson and Van der Waals. It therefore requires a certain amount of 'supersaturation,' or an excess of heating, to affect the transfer from *A* to *B*, in the absence of special external interferences. I shall also assume that the transfer *A* to *B* is accompanied by an evolution of heat, *B* to *A* by an absorption of heat, and that the *A* matter is eliminated from the whole active region by gravitational convection. Finally different atomic forms are arranged between concentric spherical shells, according to their density.

Suppose, therefore, as a first alternative, that after a sun-spot period, the *td* line has been depressed by the sudden cooling of all active strata to the position *t'd'* in Fig. 1. The points *c* have been displaced towards each other and have quite vanished from the curve. *B* matter only is present. In the lapse of time, however, the line *t'd'* again rises to reach *td*, due to heat arriving from below, within the depths bracketed in the now unstable state *A*. It is agreed that the *td* position will have to be very closely approached, or a considerable 'supersaturation' will be required, before another eruption occurs, which drops the *td* line to *t'd'* in turn. Whereas the depression of this line is relatively sudden, its gradual rise together with the prop-